15:47:45 OCA PAD AMENDMENT - PROJECT HEADER INFORMATION 12/05/91

Active

Project #: B-10-651 Cost share #: B-10-359 Rev #: 4
Center # : R6568-0A0 Center shr #: F6568-0A0 OCA file #: 133
Work type : RES
Contract#: AGR DTD 880802 Mod #: LTR OF 11/19/91 Document : AGR
Prime #: Contract entity: GTRC

Subprojects ? : N CFDA: N/A
Main project #: PE #: N/A

Project unit: OIP Unit code: 03.010.200
Project director(s):
DYER F B OOD (404)894-3539

Sponsor/division names: INFORUM ASSOCIATES INC / ATLANTA, GA
Sponsor/division codes: 258 / 008

Award period: 880802 to 920630 (performance) 920630 (reports)

Sponsor amount	New this change	Total to date
Contract value	0.00	55,000.00
Funded	0.00	55,000.00
Cost sharing amount		55,746.00

Does subcontracting plan apply ?: N

Title: INFORUM NETWORK REQUIREMENTS

PROJECT ADMINISTRATION DATA

OCA contact: Don S. Hasty 894-4820

Sponsor technical contact

RANDY MOORE
(404)220-2683

INFORUM ASSOCIATES, ATL MKT CTR
240 PEACHTREE ST. NW., SUITE 2200
ATLANTA, GA 30303

Sponsor issuing office

JAMES A. KRANZUSCH, EVP & GEN. MGR.
(404)220-2727

INFORUM ASSOCIATES, ATL MKT CTR
240 PEACHTREE ST NW., SUITE 2200
ATLANTA, GA 30303

FAX (404) 220-2720

Security class (U,C,S,TS) : U ONR resident rep. is ACO (Y/N): N
Defense priority rating : N/A N/A supplemental sheet
Equipment title vests with: Sponsor GIT
N/A NONE PROPOSED.
Administrative comments -
LETTER DATED 11/19/91 EXTENDS PERFORMANCE PERIOD THROUGH 6/30/92.

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 08/21/92

Project No. B-10-651 Center No. R6568-0A0

Project Director DYER F B School/Lab OIP

Sponsor INFORUM ASSOCIATES INC/ATLANTA, GA

Contract/Grant No. AGR DTD 880802 Contract Entity GTRC

Prime Contract No. _____

Title INFORUM NETWORK REQUIREMENTS

Effective Completion Date 920630 (Performance) 920630 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	Y	
Final Report of Inventions and/or Subcontracts	Y	
Government Property Inventory & Related Certificate	N	
Classified Material Certificate	N	
Release and Assignment	N	
Other _____	N	

Comments_____

_____

Subproject Under Main Project No. _____

Continues Project No. _____

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Managment	Y
Research Security Services	N
Reports Coordinator (OCA)	Y
GTRC	Y
Project File	Y
Other _____	N
_____	N

NOTE: Final Patent Questionnaire sent to PDPI.

B-10-651

Georgia Tech

Frederick B. Dyer
Multimedia Technology Laboratory
Office of Interdisciplinary Programs

Georgia Institute of Technology
Atlanta, Georgia 30332-0370 USA
404-894-3539
404-894-7339 FAX

August 5, 1992

INFORUM
Atlanta Market Center
250 Williams Street
Atlanta, Georgia 30303

Attention: Mr. Brian Hogg
Executive Vice President & General Manager

Subject: INFORUM/Georgia Tech Technical Support Contract
Georgia Tech Project #B-10-651, AGR DTD 880802

Dear Brian:

The purpose of this letter is to document some of the activities under the subject contract which has now terminated. This effort, originally conceived to allow us to assist the INFORUM defining a number of technology requirements, including computer networking, was initiated on August 2, 1988 and, after a number of extensions and changes in scope of effort, was terminated June 30, 1992. This effort, which was initiated as a result of an agreement between Mr. Portman and Dr. Crecine, had several unique aspects, including the use of matching funding from Georgia Tech to leverage the funding available from the INFORUM and contractual terms and conditions which allowed a particularly close working arrangement. This has allowed considerable flexibility in the tasks we have been able to undertake on behalf of this relationship with the INFORUM.

It seems inappropriate at this time to recount the many interactions and design efforts which were jointly undertaken under this project during the past five years; however, one single thread worth noting has been the very good working relationships which have existed between the two organizations. Kathy Robichaud has been particularly helpful in providing the continuity over the years as changes took place within the Market Center and INFORUM staffs. I have found all my interactions with your people personally rewarding and I commend you on your professional staff.

While I have been the primary point of contact at Georgia Tech, many groups at Tech have been involved over the years. I have attached the final report of on the network design/requirements phase of the effort, as I believe it is still potentially a useful document to you in the event that the building networking is ever extended. Subsequent efforts have involved consultation on various computer and related issues and generally supporting your staff in facilitating interactions with Georgia Tech and others in the Atlanta High Tech community. Memos and other docu-

mentation is available on the major tasks; however, since I believe the files at the INFORUM also contain copies of the pertinent materials, and because many of those efforts were specific to events of the time, I will not include additional copies here.

While this particular contract has now concluded, we will continue be involved with the INFORUM via a number of activities, including not only the Georgia Tech Suite, but GCATT, High Tech Month, and other specific events. I certainly would welcome the opportunity to explore any other new activities that you might identify which would serve as useful interaction opportunities between us. Please feel free to contact me directly if I can be of service or if you would like more details about any of the activities mentioned herein.

Yours truly,

Frederick B. Dyer
CoDirector,
Multimedia Technology Laboratory

Enclosure

cc: Ms. Kathleen Robichaud

TECHNICAL REPORT

RECOMMENDATIONS FOR A COMPUTER NETWORK FOR INFORUM (AMCnet)

14 December 1988

for

INFORUM ASSOCIATES
Atlanta Market Center
Suite 2200
240 Peachtree Street, NW
Atlanta, Georgia 30043

prepared by

The Office of the Vice President
Interdisciplinary Programs
The Georgia Institute of Technology
Atlanta, Georgia 30332

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

Revised: 12/13/88

RECOMMENDED NETWORK PLAN FOR INFORUM
EXECUTIVE SUMMARY

The proposed network plan allows for services to both tenants and INFORUM staff in a manner which it is believed will fulfill the basic requirements for a data network for a number of years. The plan is essentially designed to provide the building wiring and a minumum of electronics, thereby reducing the initial capital costs, but perhaps more importantly, positioning the Atlanta Marketing Center (AMC) and INFORUM to exploit the rapidly changing network technology. Later sections will describe specific details of the plan; however, the essential plan is to provide connection and control facilities in a centralized manner, with a backbone of fiber-optics cable which distributed to every level of the building. From appropriate wiring closets on each floor, individual workgroups or tenant-spaces would be serviced by fiber-optics cable, Ethernet cable or twisted-pair wires, as required. The transition between the backbone network and individual local area networks would be made via bridges or routers, as required. Initially, only terminations and minimal electronics will be provided to tenant spaces, ie., "Basic Network Services", which will be based on a common Ethernet backbone network with network services for the INFORUM staff.

The choice of electronics and available wiring plant will support virtually any kind of network design and/or protocol required by the tenants and/or users of show-room and exhibit spaces. Facilities for showroom and exhibit areas will be provided on an as needed basis; however, it is recommended that adequate equipment be purchased prior to showroom needs to allow rapid response to customer requirements. The recommended equipment approach appears to be both flexible and generally available, thereby reducing the risk of implementation and support over the next few years.

The requirement for ongoing support, cost-recovery, and renewal is addressed via a scheme of layered services: (1)Basic Network Services, (2)Extended Network Services, and (3)Value-Added Network Services. In this concept, the Basic Network Services will be provided to the tenants and other users, such as the INFORUM and AMC staff, at no additional charge beyond lease, etc. This allows for a fully integrated support of the key house-keeping and minimal tenant support. For example, electronic mail and other messaging services would allow for the coordination of the various activities of the building and reduce the requirement for flyers, meetings, etc. Other services which might be required or desired by tenants, special support of showroom or exhibit activities would fall under the Extended

Network Services area and would be paid for by either the individual requesting tenant, or, if appropriate, would be an additional cost item to tenants or users. Additional services and/or revenue-producing features have been identified and grouped under the category of Value-Added Network Services, with the essential feature that each of these services have the potential of generating additional revenue beyond direct costs (ie., "profit") of providing the service. While some of the valued-added services may result from other ongoing activities of AMC and INFORUM, many of the suggested services would require further development costs, thereby requiring specific investment decisions and plans which have not been developed in detail at this time.

II. BACKGROUND AND OVERVIEW

BACKGROUND AND OVERVIEW

I. Basic Network Services

A. What are Basic Network Services?

- One Ethernet Port on the Network
- E-Mail connectivity with INFORUM
- Access to other Basic Network Users

B. Who will use them?

- Vendor/Customer
- Buyer/Customer
- Staff
- Others. - i.e. Meeting & Conference Attendees

C. Why?

The elements of Basic Network Service lay the foundation and provide the customer the path for connectivity and information interchange.

D. Where?

The Basic Network Service layer is physically located within the INFORUM building. The modular architecture can be extended to meet future needs for connectivity and information interchange in other AMC facilities.

E. When?

The service needs to be in place and operational prior to the September 1, 1989 open in order to conduct proper testing.

F. How?

- To demonstrate 'interoperability' as required by the buyer/customer.
- To provide operating efficiencies and maintain a high level of customer responsiveness.

G. INFORUM Financial Strategy

- Fee Based for Exhibitors
- Utilities Based for Tenants

H. Cost Analysis

BASIC NETWORK SERVICE

a.	Installation by Floors		$704K
1.	9th	$ 41.0K	
2.	8th	40.7K	
3.	7th	40.5K	
4.	6th	40.2K	
5.	5th	40.0K	
6.	Atrium	39.7K	
7.	Exhibit	174.1K	
8.	Mezzanine	81.3K	
9.	Lobby	93.5K	
10.	Network Center	140.2K	
b.	Network Management Equipment		$150K
1.	Monitoring Equipment	$ 50K	
2.	Maintenance Equipment	50K	
3.	Basic E-Mail	50K	
c.	Facilities		$ 45K
1.	Hub Room	20K	
2.	Management Room	25K	
	a). A/C		
	b). facilities & equipment		
			$900K

Note: This is a summary of cost developed to be used to estimate a budgetary capital investment.

II. Extended Network Service

We are in the process of evaluating requirements and opportunities for the Extended Network Service layer.

A. What is Extended Network Service?

- Basic Network Services Plus Access to Usage Sensitive Type Networks
- Adds, Moves, and Changes of Basic Network Service Ports

New information services continue to evolve and their business opportunities will need to be continually evaluated. As the specific demands for service are identified their cost and revenue potential can be determined.

The following are examples of some existing services that we may need to offer access to.

- GTNET
- INTERNET
- OTHER VALUE ADDED NETWORK SERVICES
  - Prodigy
  - CompuServ
  - Dunn & Bradstreet
- DEDICATED PRIVATE DATA CIRCUIT
- VIDEO
- PACKET SWITCHING NETWORK

- SATELLITE LINK

- PUBLIC DATA NETWORKS
  - Telenet
  - Timenet
- ISDN
- VSAT

B. Who will use it?

- Vendor/Customer

- Buyer/Customer

- Staff

- Others

C. Why?

Trends and market research tell us that customers demand access to faster and better information.

D. Where?

- Shared services will terminate in the network control room in the INFORUM building.
- Dedicated applications specific services will terminate where required.

E. When?

- Some of the services will be required in conjunction with the Basic Network Service schedule.
- Others will be required on an as needed basis.

F. How?

- Depending on the technical requirements and financial viability the access could be provided by:
  - INFORUM
  - Primary vendor
  - Service Bureau

G. INFORUM Financial Strategy

- Provide additional services that at a minimum pay for themselves.
- One Time Installation/Connect Fee
  - Cover the cost of any additional hardware and software required.
- One Time Deinstallation/Disconnect Fee
- Monthly Reoccuring Charge
  - Cover the usage cost plus a small service handling charge -- utilize the Borland Effect to encourage usage by many.

H. Cash Flow Analysis (Cost and Revenue Projections)

Financial models based on the INFORUM proforma predictions, industry trends and market research have been developed.

III. Value-Added Network Services

We are in the process of evaluation requirements and opportunities for the Value-Added Service layer.

Trends tell us that information is becoming more and more valuable. The need for faster and better information is critical to the point of remaining competitive and maybe even survival.

The following are examples of some of the Value-Added

Services that provide us new business opportunities:

A. What is Value-Added Network Services?

- Electronic Data Interchange
- Limited INFORUM/AMC Database Access
- Limited Equitable Database Access
- Qualified Lists
- Directories
- Other intelligence based services/resources owned by Portman Companies.

B. Who will use it?

- Vendor/Customer
- Buyer/Customer
- Staff
- Others

C. Why?

Trends and market research tell us that customers demand access to faster and better information.

The same trends tell us this information is very valuable.

- Preliminary reviews indicate profits derived from providing Value-Added Service will meet our financial objectives.
- Provide Operating Advantage to
  - Our customer
  - INFORUM/AMC

D. Where?

The location will not be a major issue.

E. When?

A key to success is to plan for and begin to collect information pools <u>now</u> -- System Design is critical.

F. How?

Depending on the technical requirement, availability of intelligence pool, and the financial viability -- opportunities will need to be evaluated on a case by case basis.

G. INFORUM Financial Strategy

Premium Services demand premium pricing.

III. TENANT SURVEY

TENANT SURVEYS

Two separate surveys were conducted with existing tenants of the INFOMART and with potential tenants of INFORUM. The survey was a primary research tool to document current and future network requirements and identify critical design criteria for the INFORUM network. Existing and prospective tenants were solicited regarding media, protocol, and topology choices they were inclined to use and follow. Also, any planned multi-vendor environments were discussed as well as other network requirements. A tabular form of the survey summaries follow.

In October of 1988 a trip was made to the Dallas INFOMART to survey their facilities and interview tenants concerning network utilization. Eight different companies were interviewed, all of which had different network philosophies. INFORUM was in the process of implementing a local area network via the existing broadband coaxial cable facility already installed. Novell provided the engineering and networking software (NetWare). Allen Bradley broadband equipment was used to provide data to the coax backbone on TV channels 0,1 and 2. The basic service offered the tenants was communications with the INFOMART staff. This was unanimously received by the tenants as they are normally inundated with paperwork by the staff. The INFOMART staff also offered communication with other vendors and to the exhibit floor which we found no one took advantage of.

It was apparent from the survey that communication within the tenant suite was imperative and most vendors provided that service for themselves. This seems to have been an important selling tool for the vendors and therefore any network that is installed in the building must be able to service this mixed networking environment.

Network communications with the exhibit floor was desirable by most of the surveyed tenants. Some indicated a need for high bandwidth traffic and would use the service, if provided. Other tenants took the attitude of "we have survived thus far without a network and we can survive in the future without it". It may be difficult to sell a high bandwidth connection if the costs are too high.

All tenants required network connection outside the building and most of this was accomplished via dial-up modem. Only larger companies had dedicated lines for connection to wide area networks. Teleconferencing with live video was available though INFOMART, however only a few large companies use it. This again would be difficult to sell to all tenants but may be useful to those willing to pay for the connection.

There was very little interest in inter-tenant communications as most expressed the fact that they would have little reason to communicate with a competitor. The vendors that specifically sold multi-vendor network products or services did indicate an interest in this communication capability. The strong

reluctance by most vendors to resist inter-vendor communications suggested that equipment donations were not the way to build a network in such a facility like INFOMART or INFORUM.

In November 1988, a telephone survey was conducted of some of the potential INFORUM tenants. Most of these were involved directly in the telecommunications business. They were equally divided between Ethernet and telecommunications/PBX based products. Here again, all respondents indicated a desire to network communicate directly with the INFORUM staff. Also, most of those interviewed desired some sort of connection to the exhibit floor. Few of those talked to required any video connection either within the INFORUM building or from outside. Some prospective tenants did require connection to outside networks.

Tenant Survey Response

Tenant Name	Technology Area	Connectivity Interests						Notes
		Tenant Suite	InfoMart Staff	Exhibit Floor	Outside Video	Outside Data	Other Tenants	
AT&T	Communication Equipment	1	1	2	1	1	3	Star Lan network is in Tenant Suite. Communication to exhibit floor and outside is through dial-up. Use live Video Teleconferencing Facility at InfoMart.
Arthur Young	Software Instructional Courses	1	1	1	3	1	2	Twisted Pair Novell network in tenant space presently but changing to Hewlett Packard Net. Connection to outside through dial-up. No Teleconferencing needs.
Computer Consulting Services	Consulting	1	1	1	3	1	1	No network installed in tenant space but is connected to building network. No teleconferencing needs. Connection to outside through dial-up/
CYB Systems	Unix, DOS & Mainframe Connectivity Software	1	1	1	3	1	3	Ethernet installed in tenant suite running TCP/IP. Terminal traffic to exhibit floor desirable but no video needs. Connection to outside through dial-up. No teleconferencing needs.
Data Point	Voice/Data Communication	1	1	1	3	1	3	Arcnet installed in tenant suite. Connection to exhibit floor is made by pulling own cable. Tenant space is located on two floors and connection is made by pulling own Arcnet cable. Connection to outside through dial-up.
IBM	Communication Equipment	1	2	3	3	1	3	IBM Token Ring installed in tenant suite. Was not aware of network in building and would not connect unless it were IBM token ring and running profs. Connection to outside would through private lines (profs).
Novell	Network Software "Netware"	1	1	1	2	1	3	Donated technicians time and first copy of NetWare to initiate InfoMart building network. Use channels 0-2 on existing broadband. Connection to outside world through dial-up and use teleconferencing occasionally.
Xerox	Workstations, Printers Copiers, Scanners	1	1	2	1	1	3	Ethernet installed in tenant suite. Connection to outside world through leased lines. Occasional need for video and data between tenant suite and showroom

1 - Indicates a strong desire for a connection

2- Indicates a moderate desire for a connection ("If it were there, we may would use it")

3 - Indicates no desire for a connection

VENDOR SURVEY RESPONSE

Vendor	Technology Area	Connectivity Interests				Notes
		Tenant Suite	Exhibit Floor	Outside		
				Video	Data	
Ungerman Bass	Local Area Network Equip.	1	1	3	3	Interested in Fiber as backbone and twisted pair for distribution. Would run XNS & TCP/IP protocols on a bus architecture. Fiber connection to exhibit floor.
SUN Microsystems TOPS Div.	Network Application Software for Appletalk & Ethernet	1	1	3	3	Coax and Twisted pair in tenant suite running Appletalk and Ethernet on a bus architecture. Twisted Pair and coax connection to exhibit floor.
Kinetic	Appletalk to Ethernet Gateway	1	1	3	1	Ethernet and Twisted Pair in tenant space and exhibit floor. Need to show Ethernet and Appletalk working together. Internet/Arpanet connection to Ethernet.
Gandalf	X.25, Ethernet, TCP/IP	1	1	3	1	Twisted Pair and Coax in tenant suite running TCP/IP and X.25 protocols. Twisted Pair connection to exhibit floor. Connection to outside through dial up.
Codex	Voice/Data Communication	1	1	3	1	Twisted Pair in tenant suite. Star topology cluster to T1 multiplexer. Twisted Pair to exhibit floor. Application: demonstrate network management software. T1, 56Kb and 3002 Analog Circuit to outside world.
Ericsson	Voice/Data Communication PBX & Telco Equipment	1	1	3	3	Twisted Pair in tenant suite with star topology. Twisted Pair connection to exhibit floor.
Prodigy	Information Services	1	1	3	3	Multiple phone lines with RS-232 modem connections in tenant suite as well as to exhibit floor. Expressed no interest in digital data connections.
Novell	Network Software	1	3	1	1	Coax, Fiber Optic and Twisted Pair in tenant space. No interest in a separate demonstration area. Interested in satellite links for product announcements.

1 - Indicates a strong desire for a connection
2 - Indicates a moderate desire for a connection ("If it were there, we may would use it")
3 - Indicates no desire for a connection

IV. NETWORK DESIGN DETAILS

DESIGN CONCEPTS CONSIDERED AND RECOMMENDATIONS

December 14,1988

BROADBAND: Investigate the possibility of converting the security CCTV system to a midsplit broadband system. Security cameras are presently on the Exhibit and Vendor floors located at the elevators and the center hall of the building.

Redesign the system such that it has bi-directional couplers and splitters so that twoway data communication can be injected into the system. Extend the broadband cable into the vendor space on an as needed bases. This technology has a limited future in high speed intelligent data communications. Therefore a heavy investment in expanding the broadband cable plant should not be undertaken until the need arises. Broadband can support ETHERNET, TOKENRING and vendor specific protocols.

Recommendations: After investigating broadband too expensive, technical dead end and not required by any tenants, therefore recommending not to include in the project at this time.

PHONE WIRE: A minimum of a twisted 25 pair should be run to each energy column backboard for data communications. The cable should follow the same route as the telephone system. It is recommended to utilize the AT&T PDS standard for wiring and terminating equipment with color coding for data communications. Shielded twisted pair cable is recommended over unshielded. Shielded twisted pari cabling can support IBM token ring where unshielded wiring cannot.The cable should run from each energy column to the data communications terminations area, which assumed to be located in the MDF or Tel-Co equipment room. Data communications on twisted pair telephone wire is an emerging technology and can be easily integrated into the building network. Twisted pair can support data communications such as APPLETALK, ETHERNET, limited TOKENRING, RS232 ASYNC and point to point communications.

Recommendation not to include twisted pair in the project at this time because the cable distances from each energy column to the network center exceed the 300 foot limit for twisted pair ethernet. Also

FIBER OPTIC: A six fiber cable should be run from each energy column backboard to main data communication interconnection area. All the fibers should be terminated on each backboard and in the interconnection area. Establish an ethernet system with two of the fibers. Provide one fiber optic ethernet transceiver per energy column. Terminate the fiber cable in the interconnection area into a star coupler. The unused 4 fibers are for use as point to point interconnections, vendor specific protocols and expansion as peril networks should the need arise. This is the data communications media of the future.

STAR NETWORK COUPLERS:

A star coupler will logically connect together the active fiber optic pair from each floor in combination with a data link bridge, thus forming a logical subnetwork per floor. A star coupler and data link bridge combination will be provided for 9th thur 5th floors, Atrium and Exhibit floor, external network interconnections also INFORUM staff and operational areas. All the star coupler - data link bridge configurations will be interconnected together with a multiport ethernet transceiver. All of the fiber terminations, star couplers, data link bridges and other data network interconnection devices will be located in a central location. By providing a central interconnection location network trouble shooting, analysis and reconfiguration can be easily accomplished. Also the installation cost will be much less by concentrating these devices into one area.

ANALYSIS:

This type of interconnection will allow the integration of broadband, ethernet, twisted pair and fiber optic networking into a homogeneous data network system with infinite possibilities of reconfiguration to suite the owners and vendors future needs. By terminating all the cabling system in a common area reconfiguration to handle vendor specific request for short and long term will require minimum effort and equipment. For example should a vendor want a set of twisted pairs or pair of fiber optics cable from his vendor space to the Exhibit floor. Just assign unused cables to the vendor and make the jumper interconnections for the vendor.

Thus by providing active media and unused media available Inforum will be able to provide an active network and at the same time will be able to handle any special configurations and/or networking protocols a vendor could request.

By utilizing data link bridges will network protocol

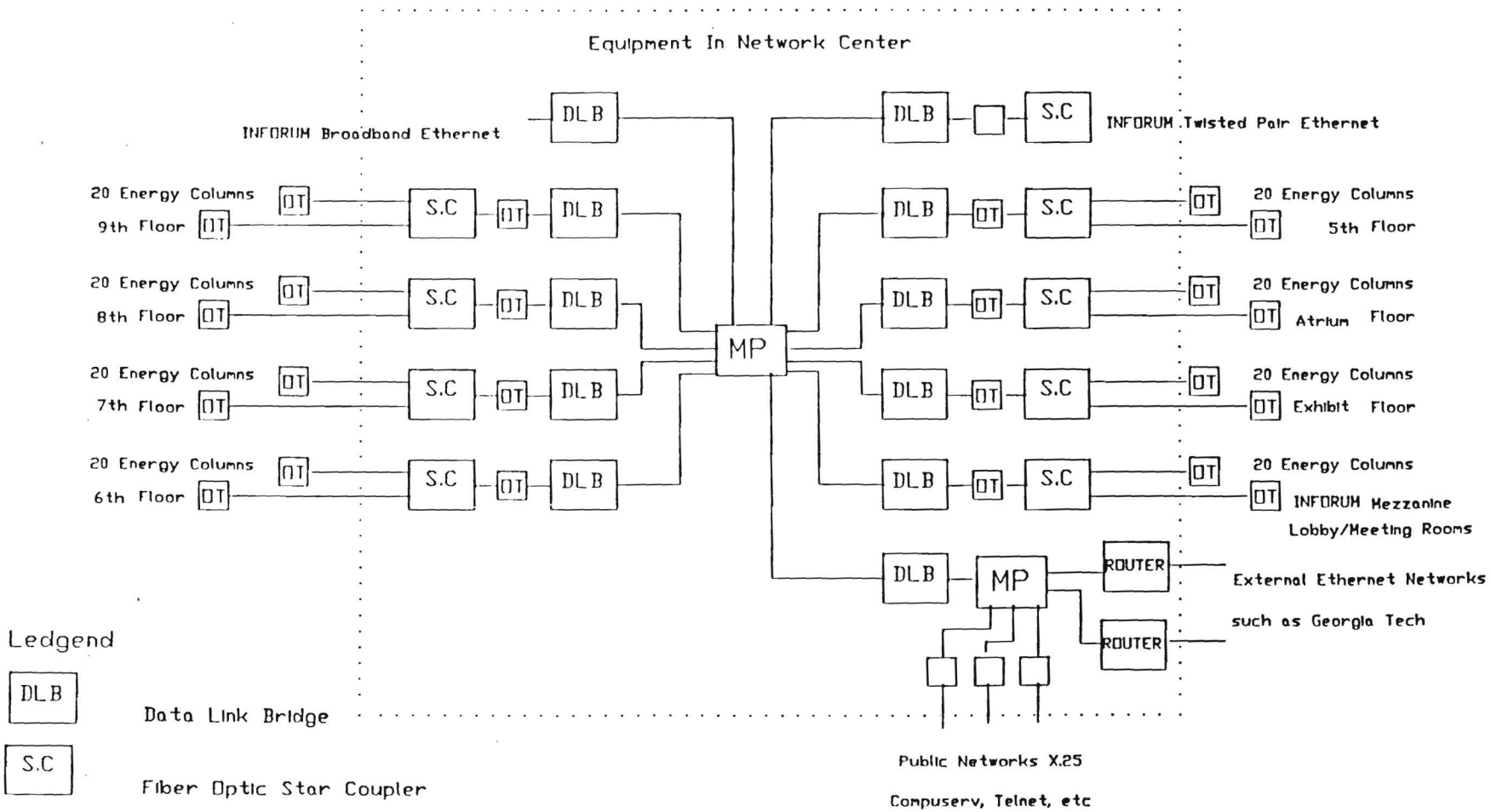
transparency will at the same time providing the functionality of subneting the networks. It is suspected that the vendors communications highest needs will be to communicate on the same floor and to support demonstrations on the exhibit floor from time to time.

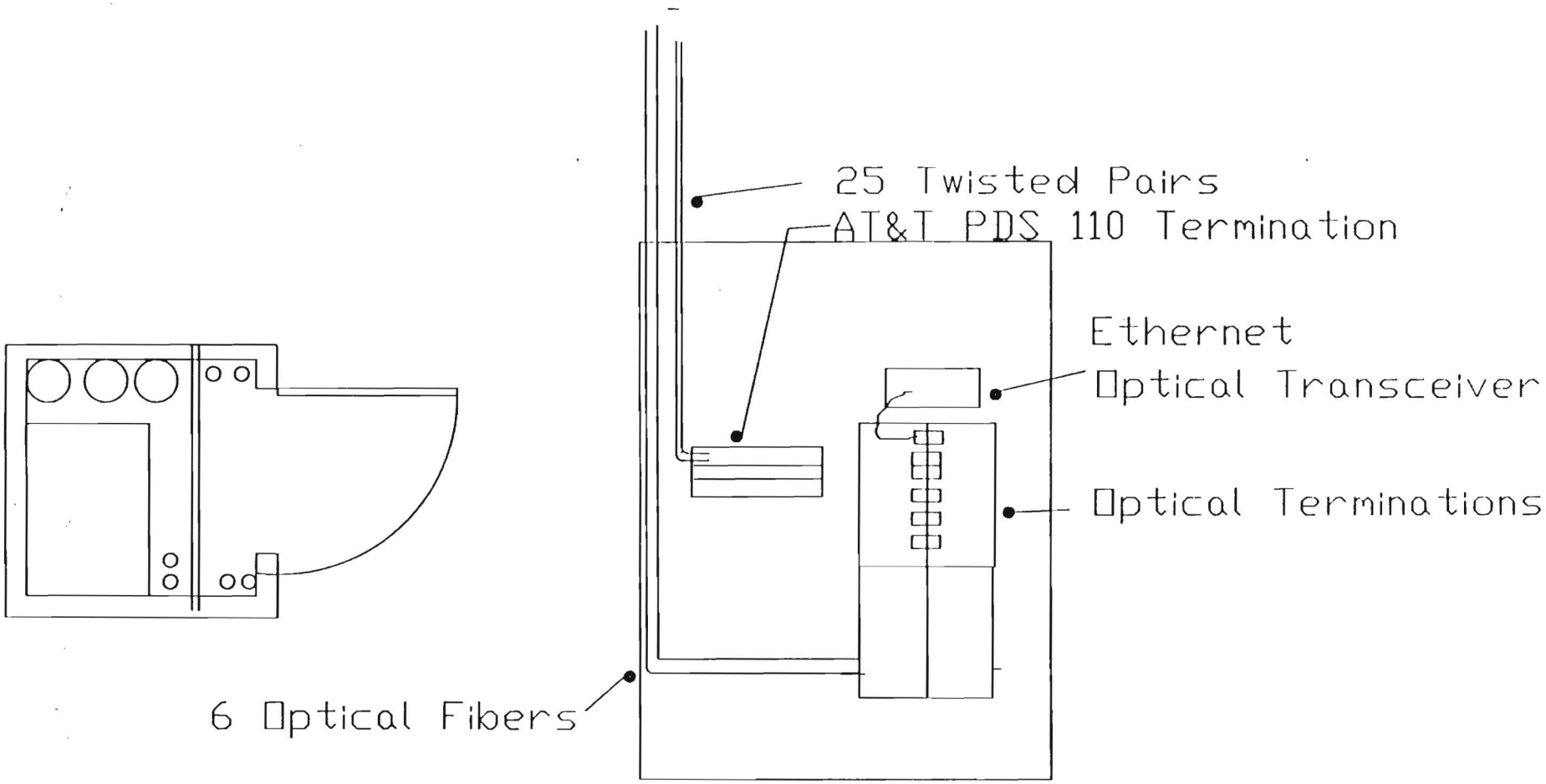
Should the 10 megabit backbone data communication traffic reach an unacceptable level then the multiport transceivers can be replaced with a 100 megabit FDDI system. Also as mentioned above the additional fiber can be brought into network service as a parallel network joined together for interconnectivity

External Network interconnections should be made with TCP/IP and later with OSI routers. This will provide protection to INFORUM users from users in external networks causing interference likewise Routers will contain the INFORUM users from disturbing users on other networks.

INFORUM Network Diagram

10 Mbyte Ethernet Building Networks
10 Mbite Ethernet Backbone
Protocol Transparent





Energy Column Backboard Detail

INFORUM DATA NETWORK CONFIGURATION

December 8, 1988

Design Concept:

The intra-building network design is 10 mega bit ethernet. Each building floor is connected to each other utilizing data link bridges and fiber optic star couplers. The data link bridges provide for protocol transparency and network management. Thus allowing multiable tenant protocols to co-exist on the network.

Each tenant will receive as his base connnectivity one ethernet connection to his tenant space. Additional ethernet connections and/or additional network circuits are available as the need arises. These needs have been anticipated. Optional tenant connectivity plans have been developed. As tenant needs are defined these options can be employed

9th thru ATRIUM Floors:

Eight energy columns will have 6 fiber optic fibers terminated, providing 3 fiber circuits. The fiber pair cables will be terminated in the interconnection room.

EXHIBIT

Adjacent to the power panels on 12 columns a communication panel will be installed which will contain 6 fiber optic fibers. Also an ethernet cable will be located in the communications panel. Space has been provided for ethernet multiports concentrators if needed during shows. The terminations will be such that the exhibitors will simply plug to the cabinet without opening the doors thus providing some protection for the cabling and fibers. All of the cables will be terminated in the network center room.

MEZZANINE

The existing phone system if wired properly should provide 2 twisted pairs in addition to the pairs required for telephone service at each phone location which can be utilized for ethernet communications with the proper electronics. At each phone location the phone receptacle will be changed out for a duplex RJ45 jack. The data communication circuit will be terminated in the network center room. The wiring system is capable of supporting ethernet and limited dumb terminal communication in a network with adaptive electronics.

LOBBY

Most of the meeting rooms can be divided into smaller meeting rooms. The smaller meeting rooms spaces will be referred to as meeting room zones. Each meeting room zone will receive 2 fiber optic fibers and an ethernet transceiver cable. All cables will be terminated with surface mount receptacle boxes. The cables will be terminated in the network center room. The other data areas such as registration will be served with an ethernet connection located under the registration counter which will serve as direct ethernet connections for registration computer. The registration dumb terminals will connect directly to the registration computer with direct connect RS232 cabling.

NETWORK INTERCONNECTION ROOM

The network interconnection room will contain all the network cabling terminations, patch panels, network star couplers, network bridges and jumpers. This is the heart of the network, thus the network center. The basic configuration will provide a star coupler and data link bridge for each major functional area of the building, Atrium thru 9th floor, Exhibition floor, Lobby, Mezzanine and all registrations locations and external networks. Thus grouping of the functional areas into a subnetwork. All the subnetworks will be combined into an enterprise network. This is the foundation for the basic network services.

In addition the network center has the capability of INFORUM being able to provide a tenant with a decided data network circuit from any point of a floor to any point on another floor with a minimum of effort and expense. Example, If two tenants wanted to demonstrate their compatibility of their products over fiber or twisted pairs. Inforum personnel would simply install jumper cables in the interconnection room and the decided circuit is installed. Likewise if a tenant wanted a decided circuit from his lease space to the exhibit floor a jumper can be installed and the circuit is made.

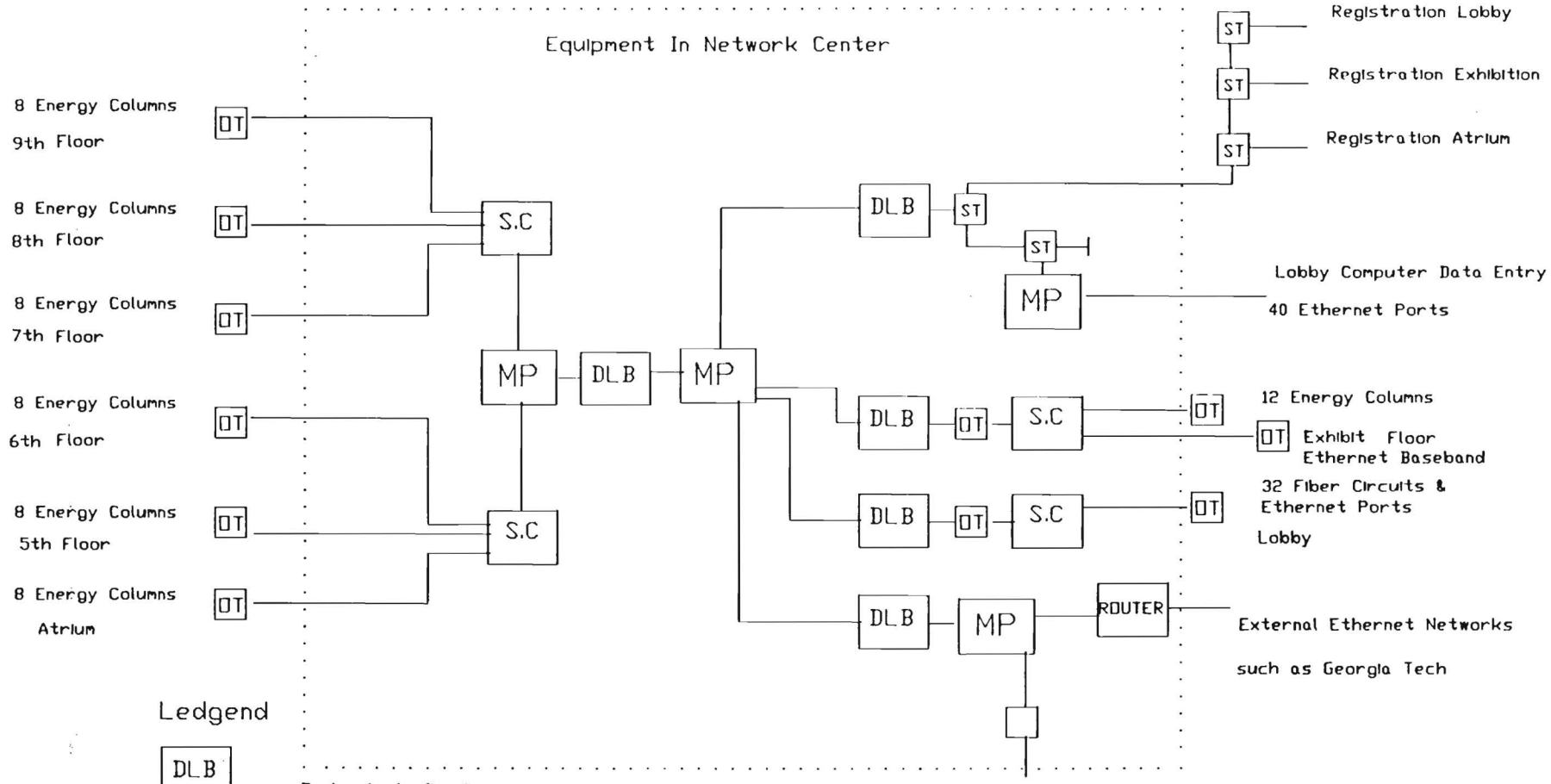
The network interconnection room will also house the network management and test equipment. This area is intended to be a data network service and operations center.

IN[illegible]UM Network Diagram

10 Mbyte Ethernet Building Networks

10 Mbite Ethernet Backbone

Protocol Transparent



Ledgend

DLB — Data Link Bridge

S.C — Fiber Optic Star Coupler

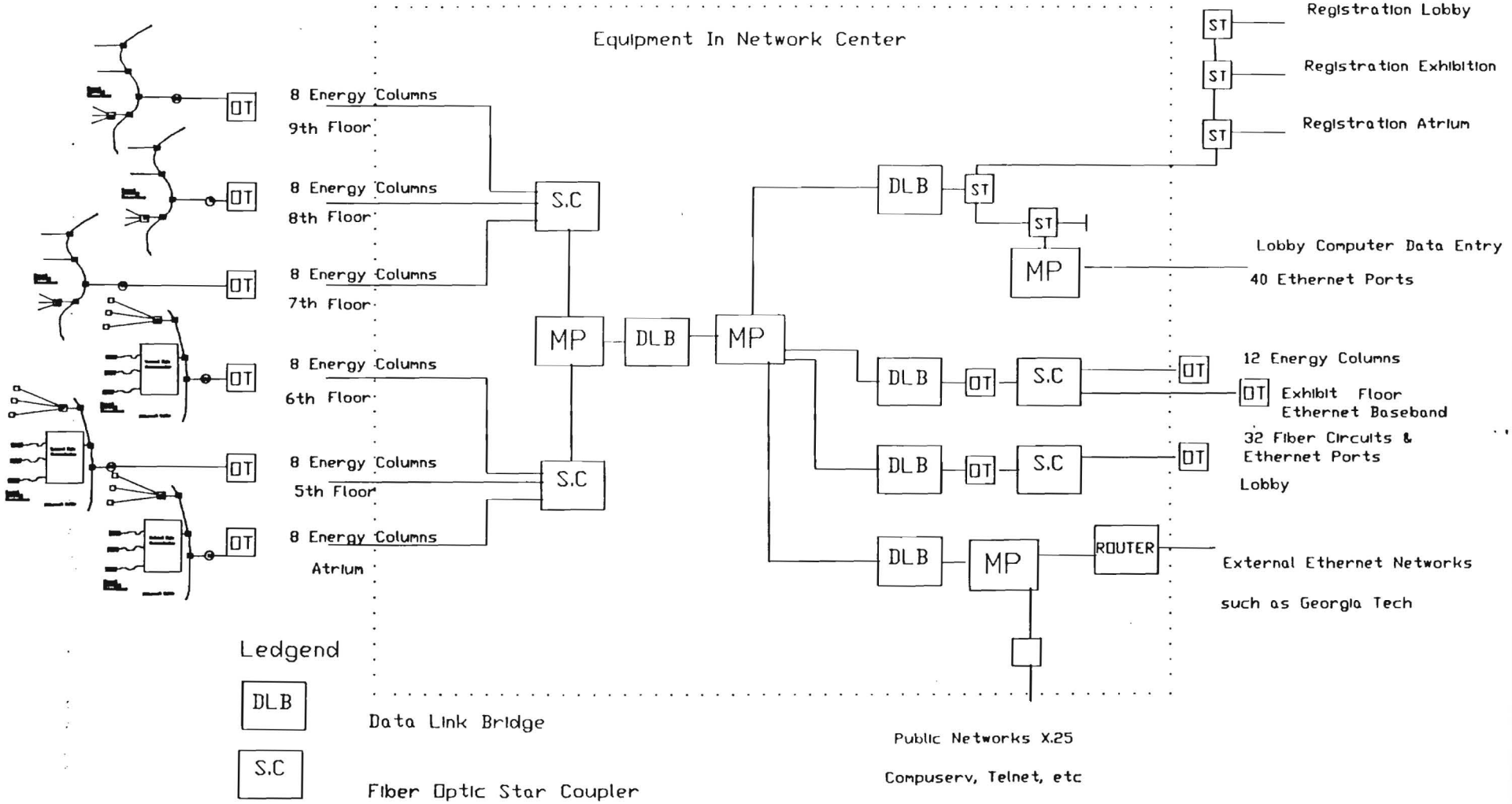
ROUTER — TCP/IP IP Router

MP — Ethernet Multiport Transceiver

OT

INFORUM work Diagram

10 Mbyte Ethernet Building Networks
10 Mbite Ethernet Backbone
Protocol Transparent



Ledgend

DLB — Data Link Bridge

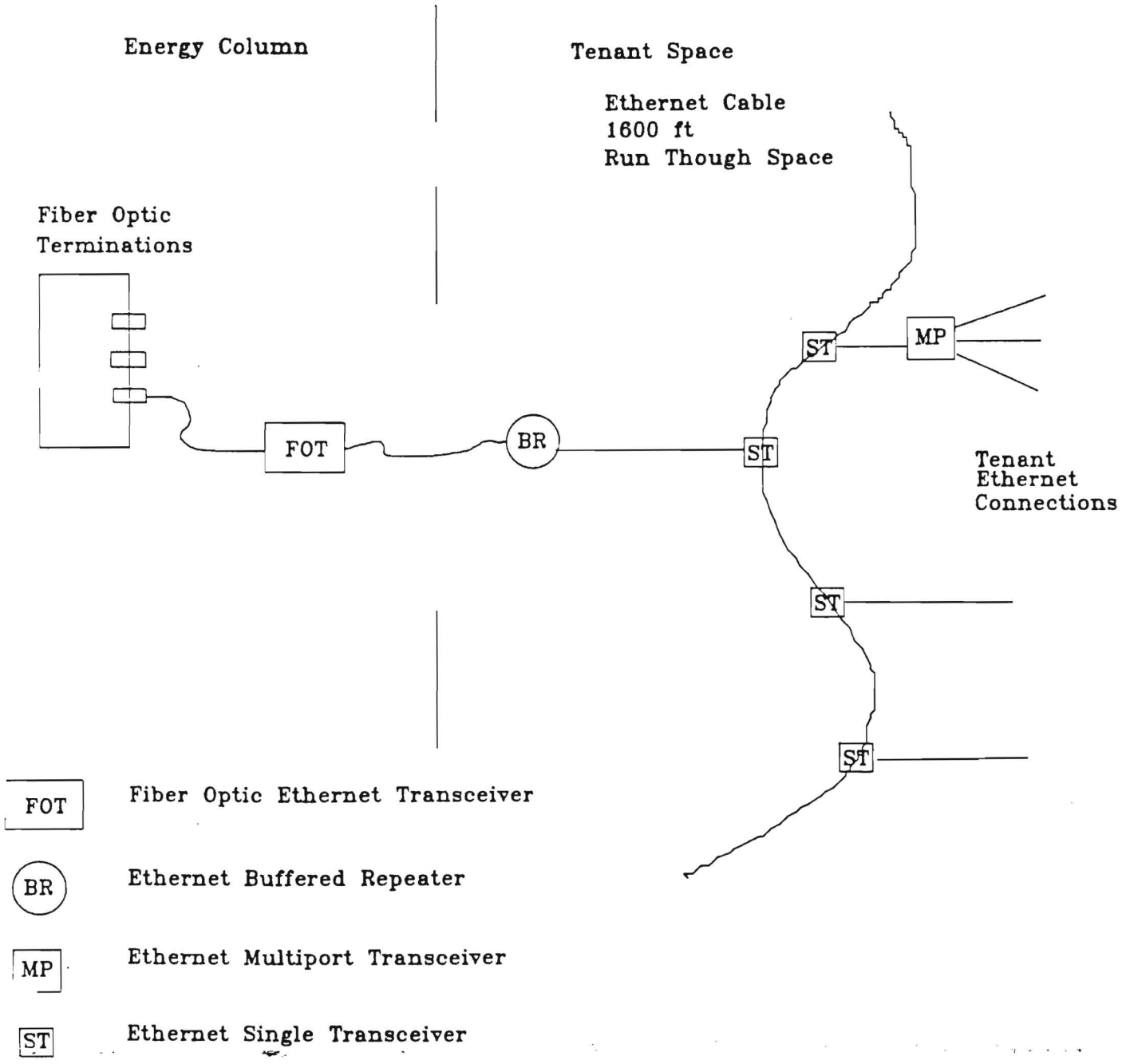
S.C — Fiber Optic Star Coupler

ROUTER — TCP/IP IP Router

MP — Ethernet Multiport Transceiver

Tenant Network Connections

Option A



Tenant Network Connections
Option A
Direct Ethernet

Each energy column are equipped with a fiber optic ethernet transceiver as part of the backbone design. The follow cost are associated with establishing tenant connections for one or more tenants.

Scenario: Extend basic ethernet services into the tenant spaces by connecting standard thick ethernet cabling to the ethernet fiber optic transceiver in an appropriate energy column. Installing ethernet transceiver cabling from tenant network port location to the ethernet cable. Connect the two via single or multiport transceiver taps.

Setup Cost Budget:

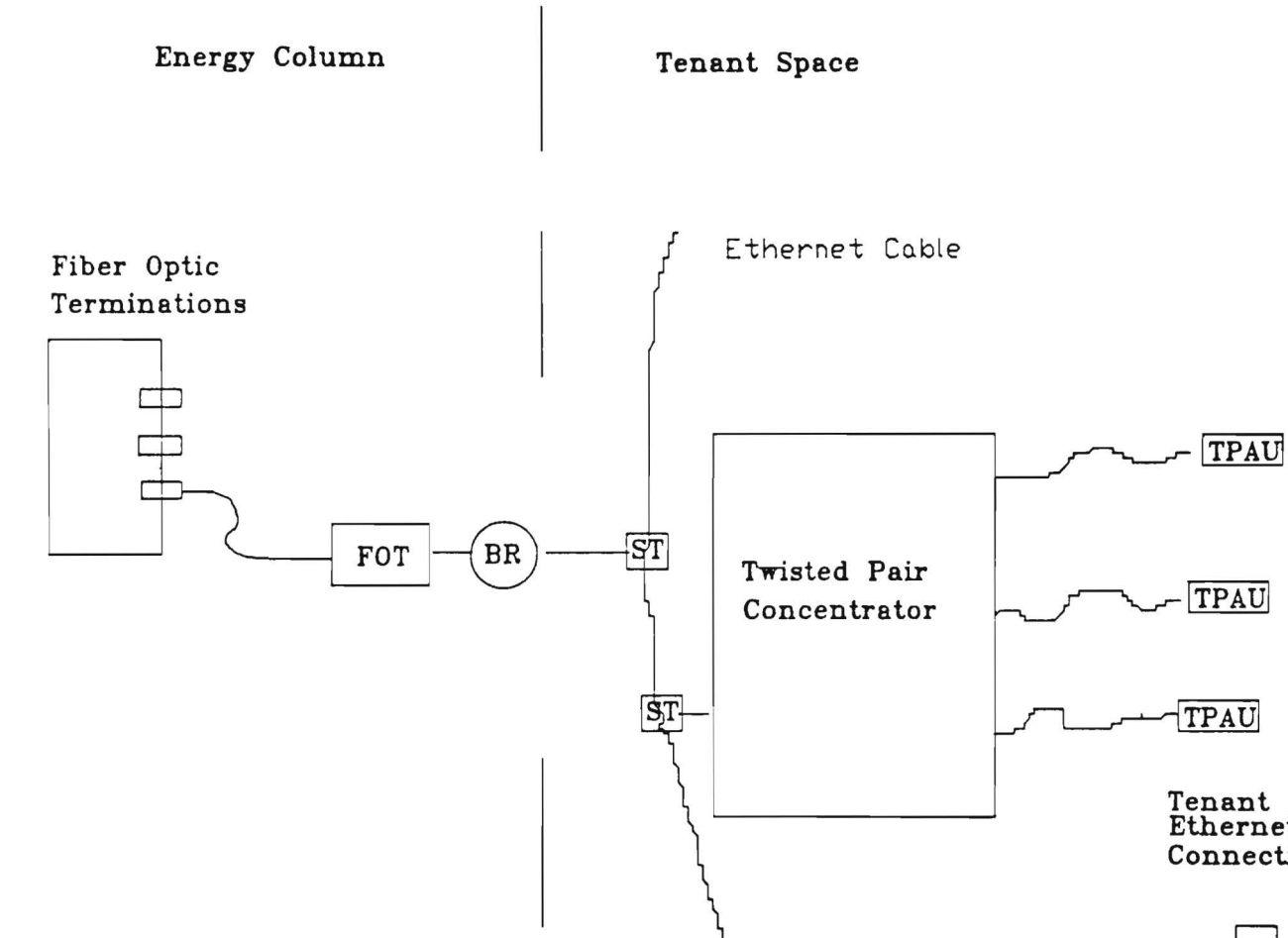
Buffered Repeater	$2,550.00	
Ethernet Cabling $2.75/ft installed. 500ft up to 1600ft	$4,400.00	
Total		$6,950.00

Average Cost Per Tenant Connection Budget:

Ethernet Transceiver	$235.00	
Transceiver Cabling etc.	$350.00	
Total		$585.00

Tenant Network Connections
Twisted Pair & Direct Connect Ethernet

Option F



FOT — Fiber Optic Ethernet Transceiver

BR — Ethernet Buffered Repeater

MP — Ethernet Multiport Transceiver

ST — Ethernet Single Transceiver

TPAU — Twisted Pair Access Unit

Tenant Network Connections
Option B
Twisted Pair & Direct Ethernet

Each energy column are equipped with a fiber optic ethernet transceiver as part of the backbone design. The follow cost are associated with establishing tenant connections for one or more tenants.

Scenario: Extend basic ethernet services into the tenant spaces by connecting standard thick ethernet cabling to the ethernet fiber optic transceiver in an appropriate energy column. Installing a twisted pair ethernet concentrator. Utilize tenant space telephone wiring from tenant ethernet port location to the energy column and connect to twisted pair concentrator. If required install ethernet transceiver cabling from tenant network port location to the ethernet cable. Connect the two via single or multiport transceiver taps.

Setup Cost Budgets:

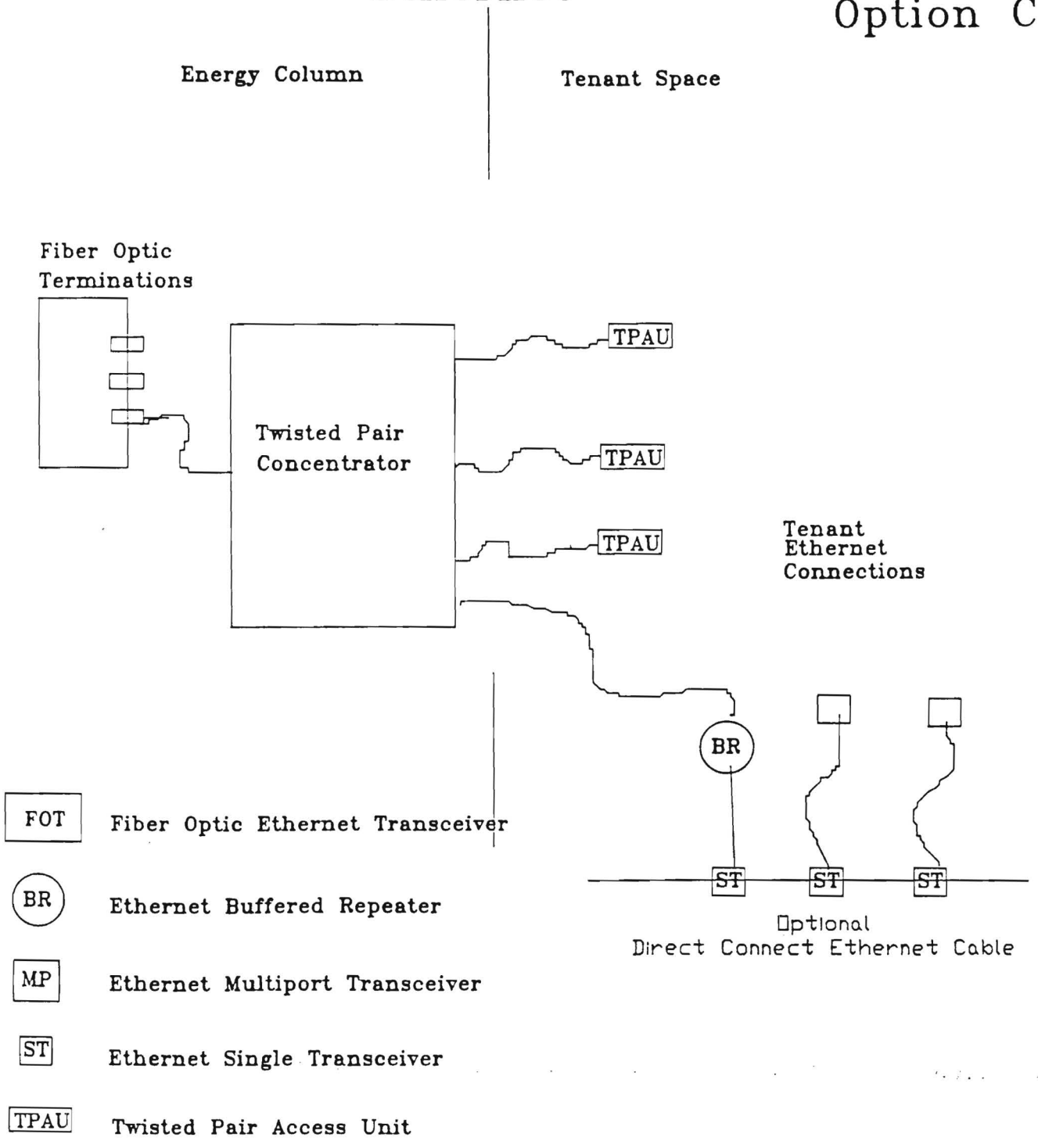
Buffered Repeater	$2,550.00
Twisted Pair Concentrator	$6,890.00
Ethernet Cabling & transceivers	$750.00
Total	$10,190.00

Average Cost Per Tenant Connection Budget:

Transceiver/Twisted Pair Access Unit	$350.00
1/12 th Twisted Pair interface	$350.00
Total	$700.00

Tenant Network Connections
Twisted Pair & Direct Connect Ethernet

Option C



Tenant Network Connections
Option C
Twisted Pair with Optional Direct Ethernet

Each energy column are equipped with a fiber optic ethernet transceiver as part of the backbone design. The follow cost are associated with establishing tenant connections for one or more tenants.

Scenario: Extend basic ethernet services into the tenant spaces by connecting standard thick ethernet cabling to the ethernet fiber optic transceiver in an appropriate energy column. Installing a twisted pair ethernet concentrator. Utilize tenant space telephone wiring from tenant ethernet port location to the energy column and connect to twisted pair concentrator. If required install ethernet transceiver cabling from tenant network port location to the ethernet cable. Connect the two via single or multiport transceiver taps.

Setup Cost Budgets:

Twisted Pair Concentrator	$6,890.00
Total	$6,890.00

Average Cost Per Tenant Connection Budget:

Twisted Pair Access Unit	$350.00
1/12 th Twisted Pair interface	$350.00
Total	$700.00

Optional Direct Ethernet Connections:

Setup Cost Budget:

Buffered Repeater		$2,550.00
Ethernet Cabling	$2.75/ft 500ft	$1,375.00
	Total	$3,925.00

Average Cost Per Optional Ethernet Connection:

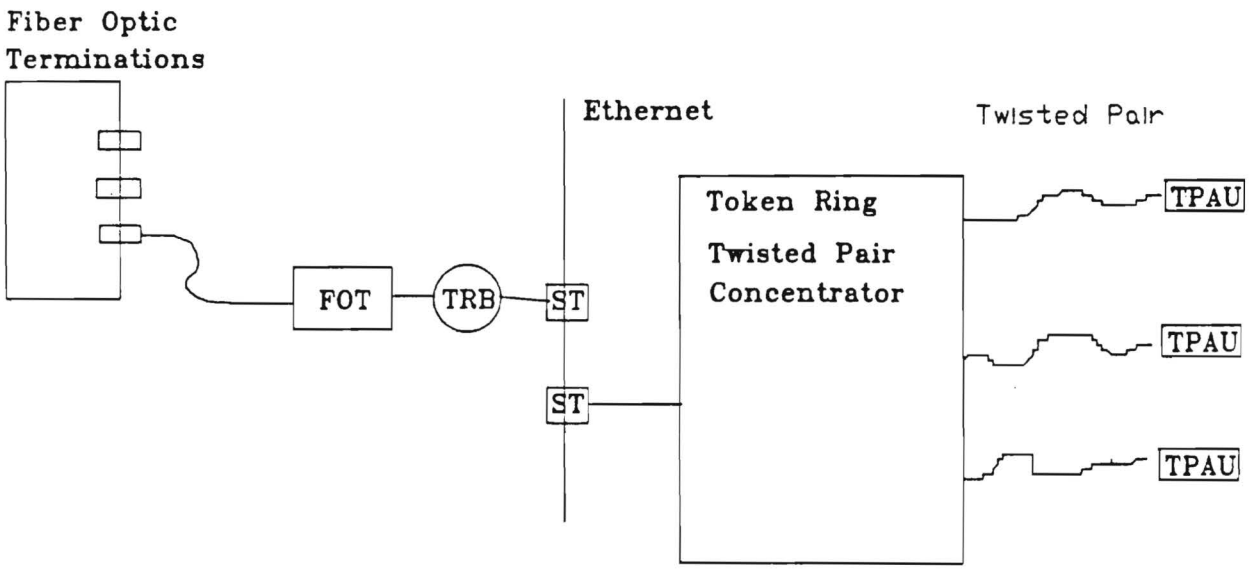
Ethernet Transceiver	$235.00
Ethernet Transceiver Cabling	$250.00
Total	$485.00

Tenant Network Connections
Twisted Pair Token Ring

Energy Column

Tenant Space

Option D



Tenant
Ethernet
Connections

FOT — Fiber Optic Ethernet Transceiver

TRB — Token Ring Bridge to Ethernet

MP — Ethernet Multiport Transceiver

ST — Ethernet Single Transceiver

TPAU — Twisted Pair Access Unit

Tenant Network Connections
Option D
Token Ring Twisted Pair

Each energy column are equipped with a fiber optic ethernet transceiver as part of the backbone design. The follow cost are associated with establishing tenant connections for one or more tenants.

Scenario: Extend basic token ring services into the tenant spaces by installing a token ring twisted pair ethernet concentrator. Utilize tenant space telephone wiring from tenants port location to the energy column and connect to token ring twisted pair concentrator.

Setup Cost Budgets:

Twisted Pair Concentrator	$6,890.00
Total	$6,890.00

Average Cost Per Tenant Connection Budget:

Twisted Pair Access Unit	$350.00
1/12 th Twisted Pair interface	$350.00
Interconnect	$100.00
Total	$800.00

AT&T Premises Distribution System

The AT&T Premises Distribution System (PDS), as designed by AT&T, is a total system approach to the cabling requirements of a communication system.

The Access/One interfaces with the horizontal wiring subsystem (station wiring) at the crossconnections located in the administration subsystem (distribution field) as shown in Figure 5-11.

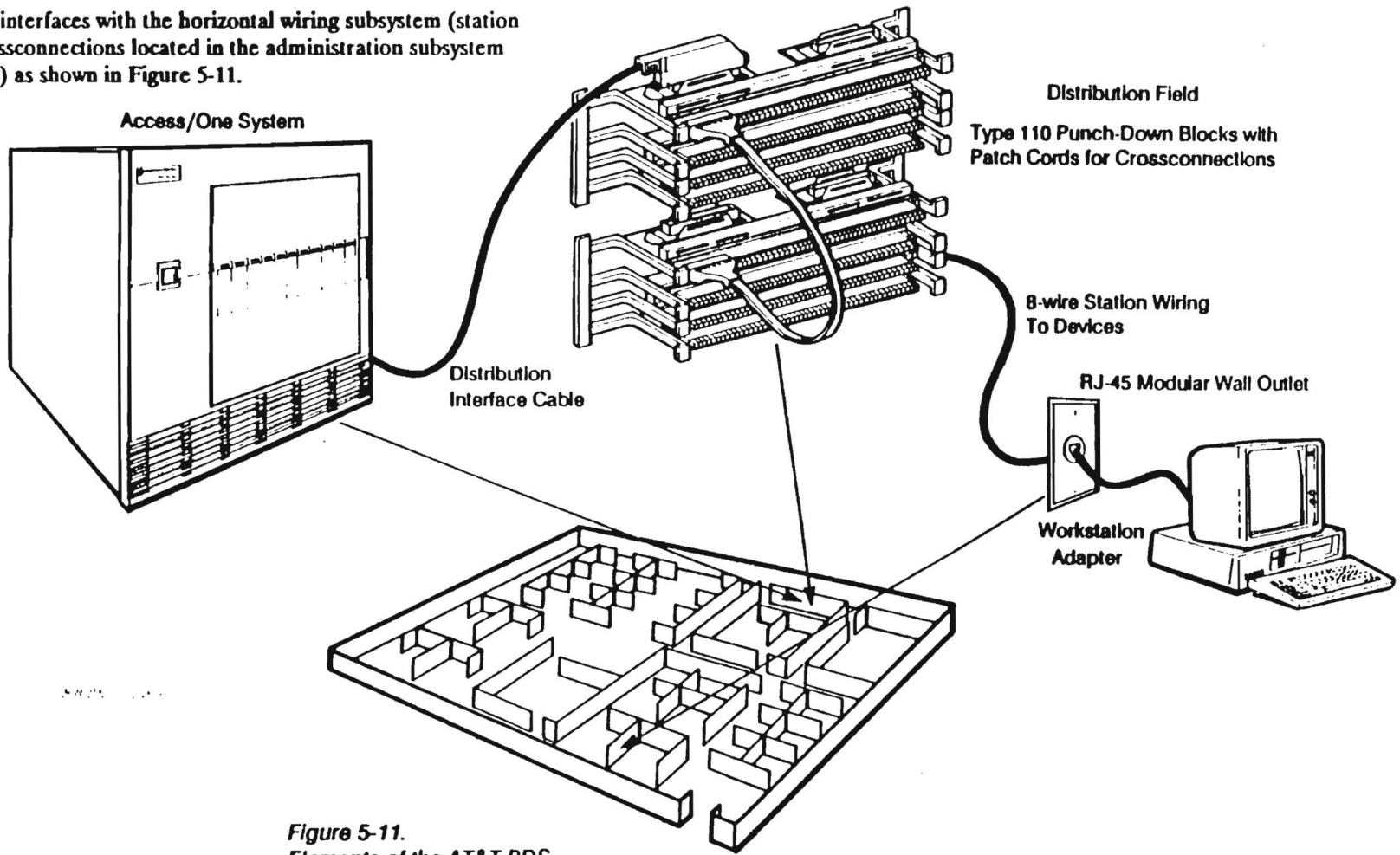


Figure 5-11.
Elements of the AT&T PDS System

IBM Telephone Wire Cabling System

The IBM Telephone Wire System using IBM Type 3 (unshielded twisted pairs) cable is designed to provide a common cabling system for use with IBM communications products. The basic elements of the IBM Telephone wire cabling system are shown in Figure 5-7.

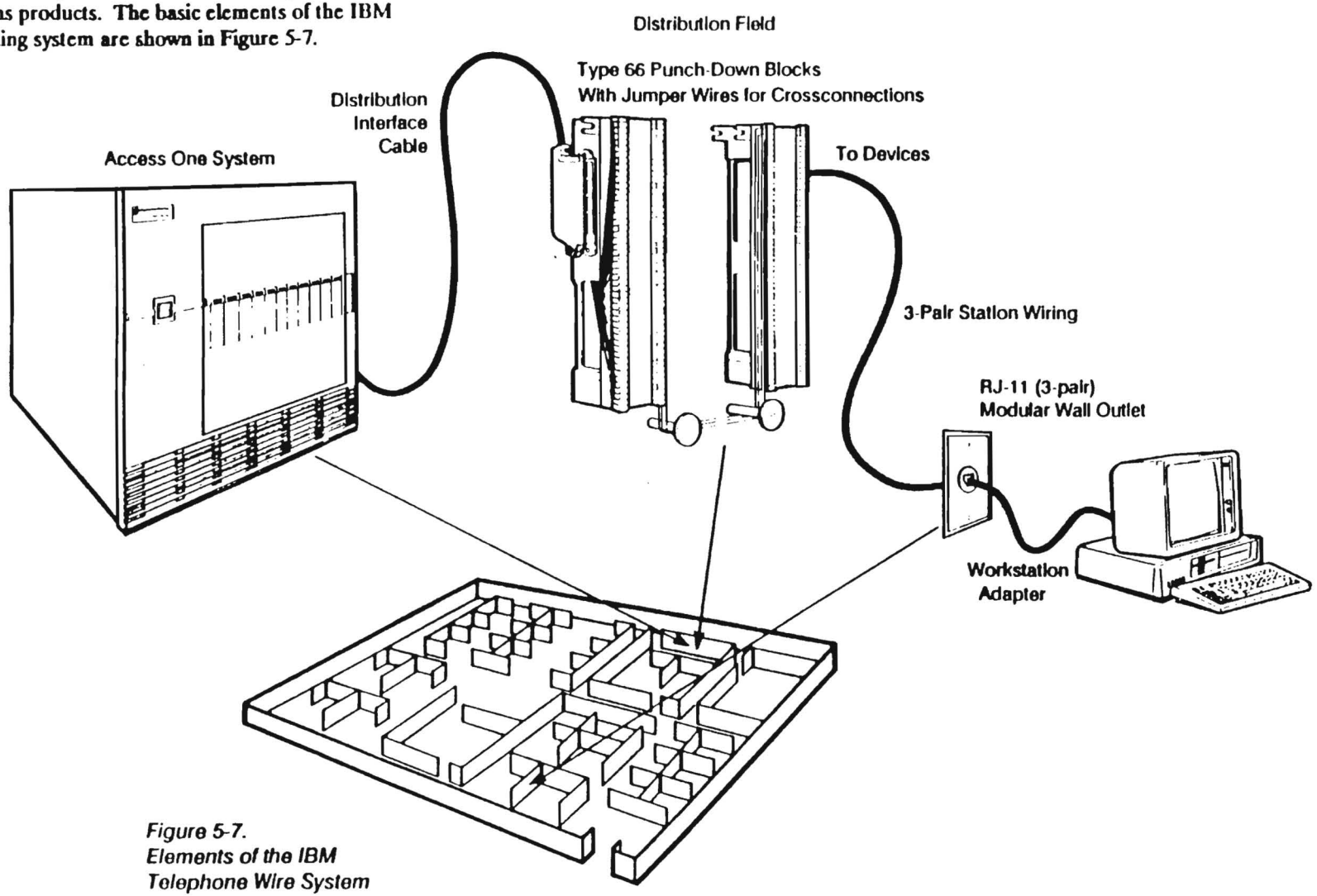


Figure 5-7.
Elements of the IBM
Telephone Wire System

INFORUM Network Installation Budget
8 Columns per Floor

Floors	Subtotal
9th	$40,976.91
8th	$40,724.65
7th	$40,472.39
6th	$40,220.13
5th	$39,967.87
Atrium	$39,715.61
Exhibit	$147,102.31
Mezzanine	$81,248.50
Lobby	$93,482.66
Network Center	$140,212.88

Project Total $704,123.90

Go to BF1 for Project Sumary

Distance from Energy Column to MDF room

Floors Cond-Len	Colmuns L2	L4	J2	J5	H4	E4	D2
9th	0	752	0	0	636	532	0
8th	0	738	0	0	622	518	0
th	0	724	0	0	608	504	0
6th	0	710	0	0	594	490	0
5th	0	696	0	0	580	476	0
trium	0	682	0	0	566	462	0
XHITIT				0			
Col Tot	0	4302	0	0	3606	2982	0

xhibit Columns	B4	B5	B8	B9	B10	B11	C4
Cond-len	320	0	0	250	0	310	0

Mezzanine Data Link Bridge 8000

Offices	Avg Len	Tot Ft	$/unit	
45	200	9000	0	3029
Tel/Data Cover plates				
45			10	450
Punch-block				
8			20	0
Ethernet Ft				
400			1	300
2 inch Conduit				
400			8	3280
Network Connections			80	66190
	Subtotal			81249

Lobby Elec-room	Met rms FO & Dat	Wall Box Avg Ft.	Cabl Avg Ft.	Tray Up to Telco Rm	Tot Ft	2 Fibers FO Cable $
E1	10	100	240	250	5900	4954
C	5	100	862	250	6060	3958
E2	18	100	320	250	12060	7877
				Sub Tot $		16789

arking A
arking B
Parking C

2.07	-6 F.O. $/FT FDDI GRADE					8	NUMBER OF COL
0.65	2 F.O. $/FT FDDI GRADE					12	NUMBER OF PAN
1300	COST PER 6 FIBER TERMINATION BOTH ENDS					19.60	$ /FT 4" COND
291.29	2 EACH JUMPERS FOR ACTIVATED CIRCUITES					0.15	$ /FT 25 PAIR
0.19	Labor 18.65/100ft TO PULL CABLE						

D4	B2	B4	B9	B11	D8	D11	E9
0	0	412	364	0	0	0	558
0	0	398	350	0	0	0	544
0	0	384	336	0	0	0	530
0	0	370	322	0	0	0	516
0	0	356	308	0	0	0	502
0	0	342	294	0	0	0	488
0	0	2262	1974	0	0	0	3138

C5	C6	C7	C9	C10	C11	D4	D5
0	0	0	0	0	0	0	864

Network Management		Network Termination Room				
		O.T.	Star Cou	FO.TRN+JP	DLB	
ag Computer	0	31200	22335	13982	8000	
Mag Software	0	5200	7335	2330	8000	
Equipment	0	5200	7335	2330	0	
est Equi ment			0	0	0	
ersonnel			0	0	0	
Basic Supplies			0	0	0	
etup configurations		7800	8835	2330	8000	
		49400	45840	20973	24000	140213

et Managment Tot	0						
Transceiver	2 Fibers			Electrical Room Terminations			
Cable	Telco CA	FO Wall	Data Wall	FO Termin	Trnscv	Telco	
$	$	Box $	Box $	533	50	20	
0.94	0.05	162.00	18.00				
5525	295	1620	180	5333	500	200	
5675	303	810	90	2667	250	100	
11294	603	2916	324	9600	900	360	
22495	1201	5346	594	17600	1650	660	

H9	J9	J11	L11	L9		
662	0	0	0	780	4696	F.O.ft
648	0	0	0	766	4584	F.O.ft
634	0	0	0	752	4472	F.O.ft
620	0	0	0	738	4360	F.O.ft
606	0	0	0	724	4248	F.O.ft
592	0	0	0	710	4136	F.O.ft
					5430	F.O.ft
3762	0	0	0	4470	26496	

D8	D9	D10	D11	E4	E5	E8	E9
0	390	0	470	0	0	0	0
							55

Star Coupler	F.O. Jumpers		Subtot	Flr Tot
3585				
3750	3563	20000	45921	
1500	2106		17459	
6750	5893		46518	
15585	11563			93483

Energy Columns Cost F.O. Cable	F.O.Term						Cabnets Mounted
10577	10400						
10325	10400						
10072	10400						
9820	10400						
9568	10400						
9316	10400						
12230	15600						1380
71908	78000						1380

E10	E11	E12	E1	E3	B1	B3	F8
0	0	0	0	0	410	0	430

Avg 36' 4"conduit to cabnets	Tenant Connect	25 Pair twisted 2	Telco Termination	FLOOR COST $	
	20000	0	0	40977	
	20000	0	0	40725	
	20000	0	0	40472	
	20000	0	0	40220	
	20000	0	0	39968	
	20000	0	0	39716	
8467	109425	0	0	147102	
8467	229425	0	0	389180	SUB TOTAL PER ELEMENT

F9	D1	D3	G4	G5	G9	H5	H8
0	0	410	400	0	0	0	0

Subtotal
389180

H9	H10	H11	H12	J9	J10	J11	J12
588	0	588	0	0	0	0	0

C1	C3	F4	D12	
0	0	0	0	5430 FO ft